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ABSTRACT

A study compared performances on a test of selective auditory attention between students educated in open-space versus closed classroom environments. An open-space classroom environment was defined as having no walls separating it from hallways or other classrooms. It was hypothesized that the incidence of auditory figure-ground (ability to focus selectively on portions of incoming auditory stimuli) problems present in third graders educated in an open-space classroom environment would be greater than in third graders instructed in a closed classroom situation. Subjects, 20 students from open classrooms and 17 students from traditional classrooms, were given a selective auditory attention test after familiarization with the word-picture associations and the testing procedures. Results indicated a slightly higher performance by students from open classrooms, but not at the significant level. (Tables of data are included, and a review of the related literature, extensive references, and test results are appended.) (NKA)

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A Comparison Of Selective Auditory Attention Abilities In Open-Space Versus Closed Classroom Students

by

Gloria M. Reinertsen

Presented in Partial Fulfillment
of the Requirements for the Master of Arts Degree

Kean College of New Jersey

April, 1987

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ABSTRACT

This study was designed to determine the differences in performance on a test of auditory selective attention between students educated in open-space versus closed classroom environments. A random selection of students (20 from open classrooms and 17 from closed) were tested using the Goldman-Fristoe-Woodcock Auditory Selective Attention Test.

An analysis of the results indicated no significant difference in performance between the two groups. Mean scores of open-space students, however, were slightly higher, indicating that exposure to open-space classroom environments may have improved the ability of these students to attend selectively to auditory stimuli.

ACKNOWLEDGEMENTS

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Many schools are still designed with "open" classrooms - without walls to block out noises from other classes and hallways. This can be very distracting to the student, especially if it is compounded by a genuine auditory figure-ground problem.

A number of educators have discovered background listening conditions to be an interference in the processing of auditory information (Goldman, Fristoe and Woodcock, 1971; Marsh, 1973; Cherry, 1981). Despite these findings, "the school environment continues to contain auditory stimuli that compete for the child's attention and thus may interfere with learning"(Finitzo-Heiber & Tillman, 1978; Sanders, 1965).

The open-space classroom exposes children to even more varied and unpredictable auditory distractions than the traditional, self-contained classroom. Thus, the open classroom could allow for a greater opportunity for interference with learning as well.

It is possible, however that extended attendance in an open-classroom environment may actually condition children to focus selectively on certain auditory stimuli (Barnett, Debra L., et al., 1982). Children who are repeatedly exposed to this type of learning environment may be developing this ability further than those who have not been so exposed.

Because there are still many open classrooms in existence, research is needed to determine whether the physical structure of these classrooms and the resulting

auditory distractions are interfering with or enhancing the student's ability to attend to instruction through the auditory modality. Students instructed in open classrooms may develop more figure-ground problems over time rather than compensate or overcome initial developmental figure-ground status.

HYPOTHESIS

To develop evidence concerning one aspect of this problem, the following study was undertaken.

It was hypothesized that the incidence of auditory figure-ground problems present in third graders educated in an open-space classroom environment is greater than in third graders instructed in a closed classroom stituation.

DEFINITIONS

For the purpose of this study, open or open-space classroom was defined as a classroom physically constructed without walls separating it from hallways and/or other classrooms, auditory figure-ground or selective auditory attention was defined as "the ability to focus selectively on portions of the incoming auditory stimuli", (Butler, 1980), while distractors were defined as competing stimuli which may interfere with selective auditory attention.

LIMITATIONS

Due to time constraints, samples from a limited population were investigated. The population consisted of 97 third grade students in one school system. Forty of these

students were attending a traditional school with typical closed classrooms. Fifty-seven were being educated in open-space type classrooms.

PROCEDURES

The subjects chosen for this study were selected from five third grade classrooms in two schools located in Freehold Borough, New Jersey. The students of both schools were from a range of backgrounds from low to upper-middle socio-economic levels, and consisted of black, white and Hispanic races.

The open-space classrooms were located in the Freehold Learning Center, a school housing grades K through four in one large open space with no walls between classrooms. Most of the students selected from this school had been there for as long as three years.

The traditional, closed classrooms were situated in the Park Avenue Annex. These classes consisted of 42 students divided into two separate classrooms, each completely enclosed by walls, with one teacher for each classroom.

A random sampling of thirty students from each school was taken, using a random table of numbers (Snedecor, 1956). The students selected were each given a parental consent form. Students who returned confirmed forms signed by a parent were selected for testing. (One student from each school was eliminated from the study - one Spanish-speaking child with limited knowledge of the English language and one

child who had a record of auditory problems.) The final selection consisted of 20 students (8 girls and 12 boys) from open classrooms and 17 students (7 girls and 10 boys) from traditional, closed classrooms.

The Goldman-Fristoe-Woodcock (G-F-W) Auditory Selective Attention Test was administered to each child individually in a closed, quiet room using a SRM 564.2121 tape player set at volume level "2" (a "comfortably loud" level). The test consisted of an "Easel Kit" (each page of which displays four simple pictures), response forms for recording the child's responses, and a tape.

The tape contains a series of three word instructions, each beginning with "point to..." and ending with a one-syllable word. There are 110 items which are divided into four parts. The first 11 items are presented with no distracting sounds (against a quiet background). The next 33 items are presented with a steady-state (fan-like) distraction; then 33 items with an intermittent distraction (cafeteria noise). The last 33 test items have a verbal distraction (a Voice presenting a story). Each distraction begins softly and becomes increasingly louder as the test proceeds.

Prior to administration of actual test items, the training section of the test was administered to familiarize each child with the word-picture associations and testing procedures used. The training section consists of thirty

sample test items with verbal directions given by the examiner rather than the tape. At this time the examiner helped the subject with any incorrect word-picture associations.

During training and testing, responses were recorded on individual response forms. One point was given for each correct item. Raw scores were determined for each test section and a total of all sections (with a possible 110 points). Using tables provided in the manual, percentile ranks were then established, using each subject's age at time of testing.

ANALYSIS OF DATA

Percentile ranks of total scores for the GFW Auditory Selective Attention Test were used for comparison between auditory attention abilities of children of open-space and traditional classroom settings.

In Table I, the mean, standard deviation and t of the traditional (closed) and open-space groups are compared.

Table I

Comparison Of Total Percentile Ranks Of Auditory Selective Attention Abilities Of Traditional And Open-Space Students

Sample	M	SD	t
Traditional	53.35	27.21	.88*
Open-space	62.25	33.12	

*NS

The means of the traditional and open-space samples were 53.35 and 62.25 respectively. The difference between the two means is 8.9 which produced a critical value (t test) of .88. This indicates that mean differences between the samples were too small to show significance.

In Table II, the mean, standard deviation and t were compared for each type of distraction measured. Percentile ranks were again used to determine means.

Table II

Comparison Of Percentile Ranks For Each Type Of Distraction Measured By The GFW Auditory Selective Attention Test

Distraction	Sample	M	SD	t	
Fan	Traditional	60.05	26.92	.79	NS
	Open-space	67.2	27.88		
Cafeteria	Traditional	47.59	25.75	1.35	NS
	Open-space	59.65	28.15		
Voice	Traditional	67	29.01	.76	NS
	Open-space	70.8	29.70		

Though t scores indicated no significance between the means of the samples for fan, cafeteria and voice-type distractions, differences between the means were 7.15, 12.06 and 3.8 respectively, with higher mean scores obtained by the open-space sample in all three distraction types.

I Q scores of subjects were obtained and analyzed to determine whether intelligence might be a determining factor

in differing Auditory Figure-ground scores. Table III displays the mean, standard deviation and t for IQs of both groups.

Table III

Comparison Of IQ Scores Of

Students From Open And Traditional Classrooms

Sample	M	SD	t
Traditional	109.56	15.43	.63*
Open-space	106.15	15.59	

*NS

Though the traditional classroom students had a mean IQ which was 3.41 points higher than the mean IQ of open-space students, a t of .63 was produced which indicated that this difference was not significant.

CONCLUSIONS

The results of this research indicate that there is basically no significant difference in the performance of students in traditional (closed) and open-space classrooms on a test of auditory selective attention abilities. However, mean scores of both samples indicate slightly higher performance by open-space students, indicating that the exposure to various types of auditory distractions encountered in the open-space classroom may have conditioned these children, improving their ability to filter out undesirable auditory stimuli.

RECOMMENDATIONS

Since so little information is available concerning the open-space classroom and its effect on auditory selective attention, more research is needed to determine the beneficial or detrimental aspects of classroom designs of this nature.

No known longitudinal studies have been conducted concerning this topic. Measure of auditory figure-ground ability before and after exposure to open-space educational environments might indicate the degree of effect that such exposure has on auditory selective attention.

Another area of research to consider for study is the relationship between auditory selective attention ability and reading performance. These measurements should also be compared for open-space and traditional classroom environments.

Selective Auditory Attention and Open-space Classrooms:

Related Literature

In order to function in the classroom, a student must filter the incoming auditory stimuli; attend to selective sounds (i.e. teacher instructions), and disregard all other noises (other children talking, rustling of papers, etc.). This ability to attend selectively to incoming auditory stimuli is referred to as "auditory figure-ground" perception.

The capacity to listen to and understand a sound, word or message in the presence of competing sounds varies from one individual to another, and is influenced by the types of competing noise (distractors), the level of distractor(s), the degree of similarity between the selected and competing sounds and their relevance to the listener. Greene and Petty (1971) cite attention and concentration as prime factors affecting a listener's reception of sounds.

A person's auditory figure-ground perception can affect his speech, language and reading skills, as well as his capacity for learning in the classroom. "Sabatino (1969) and Brotsky (1970) have indicated that there is a close relationship between auditory figure-ground perception and the development of speech and language skills." (Woodcock, 1976). According to Emerald Dechant (1981), one characteristic of the disabled reader is an inability to withhold attention from stimuli. The disabled reader, he says, is very distractable and cannot screen out competing noises; his attention is not selective. Several studies have been

completed comparing the auditory figure-ground abilities of normal and learning disabled children.

Lasky and Tobin (1973) conducted a study to investigate the effects of competing auditory stimuli on the performance of suspected learning disabled children (selected by Kindergarten entry test scores) as compared to normal children. Eleven first grade children were chosen to represent each group. The subjects were given instructions via loudspeakers which required verbal responses, non-verbal, written responses and written instructions with written responses. Competing messages were also projected over the loudspeakers (placed in 3 locations) consisting of linguistic messages designed to resemble a classroom situation and nonlinguistic broad band white noise.

The linguistic competing messages were found to interfere with the performance of children with suspected learning disabilities but not with normal children. The nonlinguistic competing noise did not interfere with the performance of either group. Lasky and Tobin present this information as an indication that during presentation of new or difficult concepts, learning disabled children should be instructed in an area away from competing linguistic stimuli.

A study investigating the selective auditory attention skills of learning disabled children as compared with the performance of normal achievers was undertaken by Cherry and

Kruger in 1983. The Word Intelligibility By Picture Identification (WIPI) test was administered first in quiet and then under three noise conditions: white noise (nonlinguistic), speech backwards (linguistic nonsemantic), and speech forward (semantic), to 44 children, ages seven through nine years.

The performance of the LD children was more affected under all noise conditions, especially the semantic type. Cherry and Kruger conclude suggesting the "LD children should be learning in a relatively quiet, noncompeting environment".

Marsh (1973) investigated the performance of 210 normal children (grades K-3) on tasks designed to measure auditory figure-ground perception, and compared this with academic achievement. Children who made more errors in the auditory figure-ground (AFG) test also had poor scores on the academic test (Wide Range Achievement Test-WRAT). Ms. Marsh concluded that "the ability to listen in noise must be more carefully evaluated and understood by those dealing with early learning and remediation."

Treisman (1964) studied the selective attention abilities of university students by playing tape recordings of English novel extracts in a woman's voice simultaneously with irrelevant messages consisting of English prose in a man's voice, passages in Latin, French, German or Czech in a man's or woman's voice, or English prose backwards. Results of

this study showed that different voice genders between the stimulus and distractor allowed a more efficient rejection of distractors. When distractors were in a different language, complete rejection of one language appeared impossible, but it was dependent upon the subject's knowledge of the language. Reversed speech caused a high degree of interference. When messages and distractors were both in the same language and voice, auditory figure-ground ability varied.

Hedrick and Kunze (1974) studied the auditory figure-ground abilities of 120 normal pre-school through third grade children by presenting a signal message (requiring a pointing response) and a distraction message (varying in relevancy, meaningfulness and intensity). "Normalcy" was established for each subject chosen by passing of a hearing test and appropriate grade level assignment for age. Resulting errors varied inversely with age, and were directly influenced by the content of the distraction message.

The development of selective auditory attention skills was investigated by Cherry in 1981, using the Word Intelligibility By Picture Identification Test first in quiet, then with each of three distractors: white noise, speech forward and speech backwards. 53 children aged 5 through 9 years were tested. Age and distractor type were found to influence test scores significantly. The semantic distractor (speech forward) caused the greatest distraction for

all children.

John Stewig suggests that children, through exposure to noise both in and outside the classroom learn to tune out or ignore unwanted sounds. He advises that in the classroom children should be provided with practice in listening attentively. James Smith (1967) also encourages the direct teaching of attentive listening skills.

One type of classroom which may indirectly "teach" students to attend selectively to external auditory stimuli through increased auditory distractions is the open-space or open-plan classroom. The open-space classroom was developed in the 1960's, and is still prevalent in many schools today. The term "open-space" refers to "an architectural concept in which several classes and teachers meet in a large area without walls" (Reiss and Dyhdalo, 1975).

When compared with traditional closed classrooms, open-space environments are found to be much more auditorily distracting (Barnett, et al., 1982; Reiss and Dyhdalo, 1975). Lillian Stephens (1974) comments that major criticism of open-plan or open-space schools is directed at the "noise and possible confusion that can result from placing so many children in one undivided area."

Studies have been conducted comparing the effects of both types of classroom settings on various aspects of student performance and personality factors. One such study compared the persistence and achievement of 173 white second

graders from open-space and traditional classrooms, (Reiss and Dyhdalo, 1975). To measure persistence, the "WISC Block Design Test" (#1 & 2) and the "WAIS Block Design Test" (#9 & 10) were used. Scores from the California Achievement Test were obtained for measuring achievement. Findings indicated that most of the students from the open-space classes seemed to be more persistent. A more positive correlation between persistence and achievement in open-space classrooms was found only in boys.

Pupil self-concept in students from open-space and traditional classrooms was compared by Ruedi and West, 1973. The self-concepts of 48 students from fourth through sixth grade were measured using Gordon's "How I See Myself" instrument (Gordon, 1968). Students from open-space classes did not score higher in pupil self-concept, but did score higher in teacher-school related items, indicating, according to Ruedi and West, that students in the open-environment classroom tended to "view school and teachers more positively, (and) are more likely to find school a friendly environment in which they can do things of interest and succeed".

Only one study was found in the literature which attempted to compare the auditory selective attention abilities of children in open-space and "traditional" classroom settings. In 1982, Barnett et al. conducted a study comparing the auditory selective attending skills of fourth grade students educated in open-space and traditional class-

rooms using the Flowers Auditory Test of Selective Attention, (FATSA).

Subjects were selected randomly for this study after establishing that their hearing was within normal limits and intelligence was within normal range. Nineteen students were selected from each of the two classroom settings. The FATSA was administered to groups of ten subjects at a time. No mention was made of any attempt to control outside noises, such as distractors created by subjects themselves in a group setting and no description of the testing environment was given.

The subjects were required to mark pictures in a test booklet which corresponded to words presented from a tape recording. As the test progressed, auditory distractors were presented with increasing complexity. Thirty-two items were presented with one point being scored for each correct item. Points were then totaled for a raw score. Mean scores were established and compared.

The investigators determined through statistical analysis that children educated in the open-space classrooms achieved "significantly higher" scores than the children from the traditional enclosed classrooms. It was concluded that "children who are exposed to varying and unpredictable auditory distractions in their classroom environments are better able to perform on tasks requiring auditory vigilance skills in the presence of distracting background noise". Barnett

et al. comment that further research is warranted concerning the effects of the open-space classroom on the attending abilities of speech disordered and learning-disabled children.

Although a great deal of a student's time in school is devoted to the task of listening, very little time is spent teaching listening skills. The literature is not abundant with information concerning the topic of listening. Information about selective listening is even harder to locate.

"The problem of controlling noise, especially early in the child's school experiences, needs more attention and consideration by educators and clinicians" (Marsh, 1973). Additional investigations of the effects of open-space environments on the selective auditory attention skills of students such as the study conducted by Barnett et al. are needed.

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APPENDIX

Park Avenue Annex (Closed or Traditional Classrooms)

	Distraction Type (Percentile Rank)				
No.	Fan	Cafeteria	Voice	Total	IQ
1	52	99	31	82	112
2	81	28	61	44	81
3	52	28	79	40	103
4	81	47	51	56	109
5	30	71	79	56	94
6	30	47	94	56	97
7	30	47	94	44	95
8	52	28	31	30	107
9	98	28	99	92	117
10	47	28	98	36	117
11	98	28	98	82	114
12	99	94	99	99+	144
13	81	94	79	92	132
14	81	28	31	40	117
15	47	43	51	26	117
16	47	43	51	26	NA
17	15	28	13	6	97

Freehold Learning Center (Open Classrooms)

No.	Distraction Type (Percentile Rank) Fan	Cafeteria	Voice	Total	IQ
1	98	94	98	99	119
2	81	99	99	99+	119
3	81	94	61	92	113
4	36	71	94	74	85
5	30	28	79	30	122
6	47	63	79	50	120
7	29	83	51	26	117
8	52	28	79	40	142
9	47	63	28	26	101
10	98	47	94	92	90
11	81	94	99	99	101
12	98	94	98	97	96
13	99	63	51	83	99
14	98	47	98	95	84
15	90	63	28	50	114
16	99	63	79	87	112
17	52	47	79	56	92
18	30	28	94	40	108
19	68	16	15	7	109
20	30	8	13	3	80

Dear Parent,

I am currently enrolled in a master's program in Reading Specialization at Kean College. One of the requirements of the program is that I conduct a study and write a research thesis explaining my project and analyzing the results.

The study that I have chosen to undertake involves determining the frequency of selective auditory attention problems among students educated in open and traditional classroom settings. (Selective auditory attention is defined as "the ability to focus selectively on portions of the incoming auditory stimuli".)

Completion of this study involves the testing of a random sampling of third grade students for selective auditory attention skills. The testing will take approximately 15 min. per student and will involve listening to a tape and selecting a pictured response.

Results will remain completely anonymous except for informing you of your child's results if you so desire. Your child's name will not be recorded in the study, as results are purely for statistical purposes. If you have any questions, I would be happy to discuss them with you.

Sincerely,

Gloria Reinertsen

Gloria Reinertsen
(842-6619)

☐ I give permission for my child to participate in this study.

☐ I do not give permission for my child to participate in this study.

Child's Name_____ Parent's Signature_____

☐ I do wish to be informed of the results.

☐ I do not wish to be informed of the results.